COVER SHEET

EMPIRICAL ANALYSIS OF BUSINESS GROWTH FACTORS USING SWEDISH DATA

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Abstract

Empirical research conducted on economic sectors in the U.S., Germany, Australia and Scotland has shown that factors such as age, size, location, legal form, and industry are related to business growth rates. Much of this research has focused on manufacturing firms thus providing little information about the effect of industrial sector differences upon the factors that are found to be significant.

This article uses Swedish data to replicate the previous research while using a different definition of business to enhance the study of effects from industry, international versus domestic businesses, and domestic versus foreign ownership. We seek to confirm that small independent firms demonstrate the greatest growth rates in Sweden as elsewhere and to explore the effects of different industrial sectors on this conclusion.

Multiple regression analysis with growth as the dependent variable shows that business age (younger grow more), beginning size (smaller grow more), independence of ownership, type of business activities (industrial sectors), and legal form are the most important factors related to growth. Although business growth differs among industrial sectors, across all sectors youth, ownership independence and small size are major factors that underlie growth across all industrial sectors.

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Introduction

Since the worldwide economic recession of 1989-91, the national economies of the European Union have experienced below average rates of business growth. This has led to a growing interest in determining what factors in business firms underlie the differences in their growth rates.

Economic theory is of little help in pursuit of this goal. While there is an extensive body of literature on theory of the firm in economics, linkages between this theory and reality of business formation, growth and decline are crude and contradictory. For example, Gibrat's law theorizes that both small and large firms will on average have the same rates of growth. But empirical evidence has refuted this theory although no alternative theory has been developed [Evans, 1987]. And, the empirically derived and widely acknowledged life cycle theory of the firm is not an economic theory at all since there is no justification for such a cycle in general equilibrium economics. Even though the role of economic theory receives a boost from a typology of economic development based upon theory of new firm formation and growth recently developed by Wennekers and Thurik [1999], an empirically testable theory remains elusive.

Empirical research conducted on economic sectors in the U.S., Germany, Australia and Scotland has shown that factors such as age, size, location, legal form, and industry are related to business growth rates. In general, these relationships have been consistent from nation to nation, but the previous research has focused primarily on manufacturing firms even though manufacturing has become an ever smaller contributor to economic growth in most of these nations. Thus, there is a need to examine these growth factors across all industrial sectors of an entire economy.

To explore business growth in an entire economy, this article uses Swedish data to replicate the previous research while adjusting for some data distortions in previous research regarding industry, international versus domestic businesses, and domestic versus foreign ownership. Among our objectives is that we seek to confirm that small, young, independent firms demonstrate the greatest growth rates in Sweden as elsewhere. We use a special 10 year database prepared for Jonkoping International Business School by Statistics Sweden that is a census of all businesses with twenty or more employees. Given the complexity of business organizations, our definition focuses on business activities rather than enterprise or establishment definitions under the assumption

that activity type is a major contributing factor to growth. Because of this focus, our "business" definition is neither the traditional enterprise nor establishment definition and the work reported here differs from other research in this way.

Consistent with previous research, analysis of this data is done with multiple regression where a growth index is the dependent variable. The results show that business age (younger grow more), independence of ownership, type of business activities (industrial sectors), beginning size (smaller grow more), and legal form are the most important factors related to growth. This confirms research in other nations that shows small, young, independent businesses (entrepreneurial businesses) are important contributors to overall business growth. In addition, we wish to demonstrate that this is true in all industry sectors.

We begin our study of factors that contribute to business growth by examining previous empirical research. Next, we develop our own model consistent with past research except adjusting the business definition to better capture the nature of business activity and adding variables to capture aspects of business globalization.

Previous Research

David Storey [1994] provides an overview of the many factors considered by researchers prior to 1994 and concludes that among small firms, there are six factors of significance. These are firm age, size, industry sector/markets, legal form, location, and ownership. Storey notes that empirical research shows that age is inversely related to growth, i.e., older firms grow more slowly than younger firms. Size of firm is another factor but one that is the source of some debate in economic theory (Gibrat's Law). As noted above empirical research has demonstrated that smaller firms grow at a greater rate than larger firms. However, Storey notes that Evans [1987] and Hall [1987] were the first to demonstrate that Gibrat's Law did not hold for U.S. firms.

Storey finds that growth rates vary by industrial sector and/or markets. Different sectors, e.g., services, retail trade, and manufacturing, have been found to grow differently and there is evidence for different growth rates of firms in different sectors. Legal form also is related to growth as firms that choose limited liability legal forms grow more rapidly. Storey notes that this is likely to be due to the fact that limited liability forms are chosen by those who wish to grow as such forms provide greater opportunity to acquire and accumulate equity capital needed for growth. Location is also noted by Storey as important since firms that locate in places where there are scarce resources or slim markets will not grow as rapidly as those in better locations.

Storey's [1994] last factor is firm ownership since small, closely held firms would be expected to reflect the interests of their owners. Storey [1994] says that fear of getting to much administration and creating problems of control are important reasons for a firm to discontinue growth after reaching the minimum efficient size.

Almus and Nerlinger [1999] also site Audrestsch [1995] and Scherer and Ross [1990] in noting that in economic theory, a firm needs to grow to a certain point, referred to as "minimum efficient size" or "optimal size" in order to achieve profitability and survive. But, optimal size varies by industry sector and is not a function of legal form. Thus, Storey's concerns about owners' fears may also exist among professional managers within larger publicly traded firms as well as owner/managers of small firms. Equally important, however, is whether the firm is independently owned or a division or subsidiary of another firm.

In the following paragraphs, we use Storey's [1994] summary as a base for reviewing more recent empirical research that has addressed this issue and to formulate our own model of growth for testing in Sweden.

Age of Firm

Age of firm is a widely used independent variable. Almus and Nerlinger [1999] used multiple regression to examine high technology firms in Germany over a ten-year period and found that older firms have lesser growth rates. Joachim Wagner [1995] also found the inverse relationship between age and growth rate in his multivariate analysis of a census of Lower Saxony (Germany) manufacturing firms. Glancey [1998] in his analysis of 117 small manufacturing firms from the Tayside Region of Scotland found that growth was inversely related to firm age. And Wijewardena and Tibbits [1999] used data from Australia in a multivariate analysis and found that older firms grow less rapidly than younger firms do. Age, then, is an important factor in determining business growth.

Business Size

Without a doubt, business size is the most widely studied factor for its contributions to growth. This is because of the widespread interest and debate on the issue of job creation and size of firm.[1] Empirical research has addressed this issue in two ways. First, several researchers have examined a cross section of firms to determine if there is a relationship between growth rate and size. Evans [1987] used U.S. data from the Compustat data files comparing firm size and growth rate and found a significant negative relationship between size and growth rate, i.e., larger firms have lower growth rates. Hall [1987] used a modification of Evans' model and came to the same conclusion. Almus and Nerlinger's [1999] bivariate Tobit-Model analysis of 580,000 high tech firms in Germany showed size of firm at the beginning of the period of study was a negative factor in determining growth. Wagner [1995] used data from a census of manufacturing firms in Lower Saxony to find a negative relationship between firm size and growth rate.

[1] For a discussion of firm size and job creation, see: Storey, 1994 and Kirchhoff, 1994.

Second, two studies focused on start-up size of new businesses. Phillips and Kirchhoff [1989] provided empirical research that showed start-up firms with five or more employees had a much greater six year survival rate than those that started with fewer than five employees. They used a census of all 814,000 firms that started-up in the U.S. during 1977-78. Later research using the same database showed that firm survival is correlated with firm growth, thereby providing an early indication that start-up size is correlated with growth in the U.S. (Popkin and Company [1991]). Confirmation was found in Wagner's [1992] research that found start-up size is positively correlated with growth among new manufacturing firms of Lower Saxony.

It is not surprising to find that newly formed firms have greater growth rates since new firms start small and they are very young. Almus and Nerlinger [1999] argue that this newness-growth phenomenon is due to the need for the firm to rapidly achieve the minimum efficient size. Beginning size and age are clearly important factors in growth.

Industrial Sector

Almus and Nerlinger [1999] found industry sector, defined as either high tech or medium tech, to be a significant factor in their analysis of German high-tech firms. Joachim Wagner [1995] found industry sector was an important factor in his multivariate modeling of a census of manufacturing firms in Lower Saxony, Germany. Phillips and Kirchhoff [1989] reported descriptive statistics that show survival rates of newly formed firms vary by industrial sector. This was confirmed by Popkin and Company [1991] using multiple regression analysis of this same data with survival rate as the dependent variable. Obviously, industry sector is an important factor for consideration in examining firm growth.

However, there are two apparent problems with examining this factor, blurring of business activities and variations in industry definitions. First, business activities are blurred because larger firms are inadequately represented by a single industry sector classification since there are many, often widely different, divisions and subsidiaries are frequently in different sectors. For example, IBM is classified as a manufacturing firm but it has many divisions that deliver services to customers. Thus grouping many different activities within a single business sector identity code may blur sector differences among firms. As will be noted later, we use a definition of "business" that adjusts for this.

Second, effective industry sector size may differ significantly among firms in the same sectors because of international operations among some but not all businesses. Industry sectors are defined based upon the products or services produced by the sector. For example, the steel industry is defined as those firms that produce steel. However, the markets for these products or services are assumed to be equivalent among all members of a

sector. In today's worldwide markets, this is not necessarily true. Differences will be most evident among firms within a specific sector that may perceive the market as the domestic environment only while others perceive and sell to a much larger world market. Other firms with wholly owned foreign subsidiaries might increase their growth by exporting goods and services from domestic locations. Still others may decrease their growth by moving production operations from domestic locations to foreign locations. To adjust for this, we add variables to measure foreign operations and changes in foreign operations.

Furthermore, growth may also be affected by changes in industry sector. Such changes may be a natural outcome of growth or a cause thereof, especially in technology intensive industries where rates of product/service changes are known to be relatively high. Popkin and Company [1991] found in its multivariate analysis that changes in industry sector were positively related to survival. Therefore, it is appropriate to examine both industry sector and change in industry sector as factors contributing to growth. We will include a variable for this factor.

Location

Storey [1994] argues that some locations are more conducive to firm growth. Davidsson [1989] agrees and models "growth opportunity" as an important variable. Further Davidsson says that characteristics of the geographical area are important for industries where firms are bound to the local market. However, the geographical area variables do not emerge as strong factors in his empirical test results.

Likewise, Almus and Nerlinger [1999] used regional population density as a location variable and found only minor indications that location affected growth rates. The effect appeared to be inverted "U" shaped with size of firm, i.e., the smallest firms and largest firms had the least location effects. It is possible that location effects are closely linked to industry factors that are associated with size. Or location effects may be associated with industries. For example, the weakness in Almus and Nerlinger's work is that they looked only at technology based firms and it is known that firms in high tech growth industries tend to cluster in the same location. Popkin and Company [1991] found that location effects were removed from their regressions when industry definition variables were allowed to enter their equations. They conclude that location is closely associated with industry clustering and probably of secondary importance.

However, Storey's and Davidsson's theoretical arguments are intuitively appealing and therefore location should be tested as an additional factor contributing to business growth. Furthermore, changes in location may also be relevant to growth rate so we will include a measure of change in location.

Legal Form

Businesses can take on several different legal forms but paramount among these is the limited liability legal form because it frees the owners from some types of liability due to the business' operations. And, some businesses can be wholly owned and governed by another business.

Initial Legal Form. Almus and Nerlinger [1999] included legal form in their multivariate analysis of high tech German firms. Their results showed that firms with limited liability form realize higher growth rates than firms where founders' private capital investments are liable. They suggest that firms with limited liability are more willing to take risks since the founders' personal wealth is protected from excess losses of the firm. Legal form therefore is a factor underlying firm growth rates.

Since legal form is obviously an important factor, it is likely that change in legal form will also be a factor in firm growth. Either the firm will change its legal form as it grows larger, or the managers will choose to change the legal form as their attitudes shift towards growth.

*Changes in Business Governance***.** Almus and Nerlinger [1999] also found that partnerships with other firms correlated with greater growth rates. Rosa and Scott [1999] describe that although high rates of inter-company links are connected with higher growth, the common practice of multiple directorships among small entrepreneurial firms may be an adequate substitute for formal partnerships. This raises an interesting issue regarding business firm relationships. Many businesses are wholly or partially owned by other businesses. Many have joint stock ownership with several other businesses. Some of these relationships extend across national boundaries and/or give access to international markets. Acquisitions and mergers may affect growth rates by changing resource availability that then promotes or inhibits growth. Thus, it is important to examine the effects of such business governance and changes in business governance such as spin-offs, acquisitions and mergers. As will be noted later, we have added variables to measure these actions of firms.

Overview

Many factors have been identified by these various authors. Even though Almus and Nerlinger [1999] and Wagner [1992] have used databases that focus solely on manufacturing, they have addressed these with a broad list of variables. Therefore, we have selected our variables for our model based upon their work. To assist the reader in comparing these studies, we have prepared Table 1 comparing these two research studies to Storey's conceptualization and our own model, which will be described next. This is shown as Table 1 below.

Designing the Model

Based upon the above review of research we developed the following model for testing:

Growth Rate = f (age, business size, overall enterprise size, industry sector, change in industry sector, legal form, change in legal form, ownership governance, change in governance, international activities, location, change in location)

The following paragraphs describe our database and its contents followed by a description of how we operationalized our variables from the available data.

Sources of the Database

The data set was developed in close cooperation with register experts from *Statistics Sweden* (i.e., the official 'Bureau of Census'). Their registers are complete in the sense that all legal commercial activity is represented, whether run as sole proprietorship, partnership, limited liability company or some other legal form.

Table 1
Comparison of Storey's Conceptual Scheme with Three Empirical Research Studies

Storey [1994] Conceptual Scheme	**Almus and Nerlinger [1999] (Western Germany)**	**Wagner [1992] (Lower Saxony, Germany)**	**Davidsson, et.al. (2000) (Sweden)**
Age:	Years	Years	Years
Size:	Number of employees	Number of employees	Number of employees Enterprise overall number of employees
Sectors/markets:	New technology based firms High tech Industries Medium-tech industries Other manufacturing Diversification	Manufacturing Industry Concentration, (Herfindahl index) Industry effect Innovations	Industry sector (16 sectors) Change in industry sector
Legal form:	Status of limited liability Team foundation	Production unit	Legal form Change in legal form Ownership governance Change in governance
Location:	Inhabitants/km^2	NA	Region type Change in region type
Ownership:	Independent firms Subsidiary/affiliated firm Skills	NA	International subsidiaries, joint ventures etc. Foreign ownership Change in ownership

Data originate from different sources such as tax authorities and mandatory surveys. Updating is frequent and generally speaking the registers are of a very high standard by international comparison. Data from three different registers, and ten annual versions of each, have been utilized in developing the data set. For a more elaborate description of the data set, see Davidsson [1997].

Business Unit

Our unit of analysis is the ***business***, which is the legal entity. This legal entity may consist of one or more establishments and may be either independent or majority owned by a parent company. We choose this unit of analysis because a focus on establishments as the organizational unit for growth evaluation is not appropriate for multi-establishment businesses. An establishment is defined as a place of work, a factory, office, store, etc. Establishments of large multi-establishment firms are not independent operating units in many respects. For example, a sales office or a single production plant may not choose their growth but may have it dictated by the parent corporation. For example, allocation of production to alternative plants is often determined by corporate level decisions, not plant level behavior. On the other hand, accepting the enterprise definition (the overall ownership organization) to define the business organizational unit places the entire hierarchy of parent and daughter companies into a single business activity. But, such large, multi-business units are in appropriate for assessing the influence of industry on growth since they are typically active in multiple industries. Using this level of business definition would blur the effect of industry sector in our analysis. In addition, such large corporate structures typically go through mergers, divestments and ownership changes of such magnitude and frequency that meaningfully following such enterprises and assessing their growth over long periods of time is almost impossible. Furthermore, large corporations typically have some business units that grow rapidly while others shrink thereby hiding the growth businesses within the overall corporate behavior. Thus, neither the establishment nor the enterprise, definitions are appropriate to determine the effect of business activity (industrial sector) in our research. Instead we define the business as the smallest formal organizational unit that has a clear industry sector definition.

On the other hand, the size of the overall ownership organization may influence the growth of its separate businesses. This size measurement has been retained in the database for all businesses that have a parent corporate ownership. That is, there are two size measures, business size and corporate size. For independent businesses (even those with more than one establishment) these are identical while for businesses in hierachically organized corporate structures the latter is always larger than the former.

Industrial codes for companies may be changed because of ownership changes, industry re-classifications, or spatial relocations. This may make what in reality is an on-going business appears in the registers as a discontinuance and a start-up. Identification codes for establishments are relatively more insensitive to changes of the mentioned kind. But, we have not accepted either industry codes or identification codes as the sole criterion for tracking businesses over time. Rather, constellations of establishments (and their employment) associated with a certain company code and industry code is regarded as 'the same' company if they appear together in the next annual version of the register even if under a different company and industry code.

Methodological Problems

The data set comprises *all commercially active businesses in the private (non-government) sector in Sweden that in November 1996 had at least 20 employees.* With respect to that category, we are dealing with a census study. Annual data for all businesses have been compiled for the 1987-1996 period. There are 11,748 such enterprises, 8,562 of which were already in operation in 1987. Previous government-sector businesses are included if by the final year they have transferred to the private sector, as are start-ups during the period if they fulfill the size criterion for the final year. However, in order to have a sound basis for computing growth rates we have demanded that businesses be active in the register at least for the final three years. This decreases the number of cases to 11,196. Businesses that dissolve during the period are excluded regardless of their previous size and growth, as are surviving businesses that may have had more than 20 employees but do not reach that number in 1996. No upper size limit has been employed, but in numbers the data set is dominated by small and medium-sized businesses.

From this description it should be clear that our data set is *not* a panel of businesses that is being followed from 1987 to 1996. Rather, the data set should be compared to a cross-sectional survey in which businesses with 20 or more employees were contacted in November 1996 and asked about their development history. Compared with the latter type of study our data set has the distinct advantages that data from previous years were collected at the time and not subject to memory error or hindsight bias. In addition, this data is a census, not a sample, of Swedish businesses.

It should also be noted that 7,590, or over 2/3, of these firms have fewer than 50 employees. This is not an unusual dispersion of firms as small firms dominate in numbers in every capitalist society. Importantly, however, the design of the data set makes it likely that positive effects of smallness on growth are exaggerated. In other words, since each observation weighs equally in the regression analysis, we may observe an over statement of size as an important variable. This is true for the other research studies noted above except for Almus and

Nerlinger (1999) since they divided their sample into size classes. On the other hand, to follow their example and divide the Swedish population into size groups will likely reduce the affect of size on growth by separating the fastest growing firms from the slower growing firms since, as noted earlier, substantial research exists to show that small firms grow faster. And, small firms are not uniformly distributed across all industries. Large firms tend to dominate in those industries that require larger scale industrial activity. Because of this non-uniform distribution of small firms among industrial sectors, the measurement of industry effects could not be considered valid. Almus and Nerlinger (1999) did not have to be concerned with this problem since they examined a carefully selected industrial sector (high technology). We, however, cannot use their technique because of the unequal dispersion of small firms among industry sectors.

On the other hand, as described below, the growth ratio we select as our dependent variable is known to reduce the affect of size upon growth since it uses the average size, not the beginning size, of the business during the growth period. Almus and Nerlinger [1999] used the logarithm of growth based on beginning size to assure accurate growth measurement. But, while their methodology provides statistical significance of the variables, it does not provide measures of relative impact of each variable. Since we are searching for relative impact, we have selected the business growth ratio and use linear regression to reveal the relative impact of the independent variables.[2]

In summary, we choose to use a linear, least squares regression across all industry sectors to properly express the affect of business size upon growth at the same time appropriately measuring industry effects. In summary, in order to more clearly identify the effect of industrial sector differences, our model risks understating the measure of business growth while overstating the affect of business size.

Operationalizing the Variables

A range of variables is available for each business each year. Size data are available for total employment, organic employment (excluding merger or acquisition activity), and sales. Sales data were not used because such were available only for a biased half of the cases. Both total and organic employment growth were tested but, since the results were highly correlated, we only present analyses concerning total employment growth.

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[2] Kirchhoff and Greene evaluate the effect on growth rates and distribution of growth between large and small firms from the use of the average size versus the beginning size of a business in the denominator of the growth rate calculation. See: Kirchhoff and Greene, 1998.

Business growth rate can be operationalized in many different ways (see: Delmar, Davidsson and Gartner [1999]). We began with the simple calculation of 1996 employment minus initial employment divided by initial employment (percent change). However, this variable has a highly skewed distribution (non-normal) that makes it unsatisfactory as a dependent variable in multiple regression analysis. The logarithm transformation is widely used to adjust for such skewness but it could not be used here because negative employment change appears in too many cases and its use would make it difficult to discern the relative effects of the independent variables. Therefore, we chose to use a growth index calculated as 1996 employment minus initial employment divided by the average of 1996 and initial employment. This growth index variable is asymptotically normally distributed. So it is statistically appropriate.

The independent variables are described in Table 2 below. We used the SPSS Version 10.0 test for collinearity and found all but one of the independent variables had a "condition number" less than 20. Beasley, Kuh and Welsch [1980] indicate that values in excess of 20 suggest potential problems. Thus, collinearity is not a problem for this regression.

Analysis Method

Since we have the population of businesses in Sweden for our database, we can conduct regression analysis and interpret the results for relative effect upon the dependent variable, i.e., business growth rate. To facilitate ease of interpretation, we will use a straightforward linear model without any transformations of the variables. The error term is assumed to be normally and independently distributed with constant variance. The assumption of normal distribution seems to be valid based on the fact that the number of our observations exceeds eleven thousand. However, when the data generating process is characterized by cross sectional observations, as is the case in the present study, one might expect that the assumption of homoscedasticity is not fulfilled. By homoscedasticity is meant that the disturbance variance should be constant at each observation point and that the disturbance covariances at all possible pairs of observation points are zero. A failure of this condition to hold leads to invalid inferences whenever the traditional formula for the ordinary least squares (OLS) variance is used in the construction of, for example, t-statistics. It is therefore important to test for the presence of heteroscedasticity.

Table 2
Independent Variables and Their Measurement Method

Business Age - AGE	Age of business in 1996. The data file only contains 25 years of data so age is truncated at 25 years.
Business Size – BEGSIZE	Number of business employees at the time of first ob-

	servation.
Overall ownership organization size – CORPSIZE	Number of overall employees at the time of first observation
Industry Sector – BEGINDUSnn	Industry codes are condensed into 15 industry sectors, each a dummy variable. The sector defined as "metal working and manufacturing" is the omitted dummy.
Change in industry sector – CHINDUST	Defined as one if industry sector code changes one or more times during the period observed.
Legal form – BEGLEG	Dummy variable. Limited liability = 1.0; all others are zero.
Change in legal form – CHGLEGAL	Dummy defined as 1.0 if one or more changes occur.
Ownership governance – BEGPAREN, BEGDAU, BEGINDEP	Dummy variables. Defined as one or zero depending on whether: parent, daughter, or independent.
Change in governance – six dummy variables	Defined as six dummy variables – a change is indicated by 1.0 (otherwise zero) for: Parent to daughter: PARDAU Parent to independent: PARIND Daughter to independent: DAUIND Daughter to parent : DAUPAR Independent to daughter: INDDAU Independent to parent: INDPAR
International subsidiaries, joint ventures, etc. – Three dummy variables.	Dummy variables: BEGINTER is 1.0 if foreign subsidiary exists in beginning. LOSINTER is 1.0 if foreign subsidiary is lost. GETINTER is 1.0 if foreign subsidiary is added.
Foreign Owned – three dummy variables	BEGFOROW is 1.0 if foreign owned at beginning LOSFOROW is 1.0 if foreign ownership is lost. GETFOROW is 1.0 if foreign ownership is gained.
Geographical location – REGTYPnn	111 labor market areas combined into 9 region types based upon structural similarities. Stockholm region is the omitted dummy variable.
Change in geographical location CHLOCATI	One or more changes in labor market area during the period of observation.

We applied the White [1980] test and the results, not presented but available on request, show that the null hypothesis of homoskedasticity could be rejected strongly. To remedy this issue White [18] suggests a correction for heteroscedasticity. He has derived a heteroscedasticity-consistent covariance matrix for calculating standard errors and t-statistics for significance of the beta coefficients. In the presented study we have used that matrix for that purpose.

When building an econometric model, the assumption of parameter stability is widely used because of the resulting simplicity in estimation and ease of interpretation. We checked for parameter stability by using the

recursive coefficients. By studying the behavior of the recursive coefficients, not presented but available by request, the parameters appear to be stable.

Results and Interpretation

Table 3 below shows the results of the regression. We used stepwise regression with each variable entering the equation if the value of beta was statistically significant when the variable was added to the equation. Significance was defined at a probability of 0.05 or less. Table 3 shows the variables that entered the equation given this criterion for entry. All other variables failed to enter the equation, i.e., would not be statistically significant if they entered the equation.

Table 3 shows the normalized (or standardized) regression coefficients. These coefficients represent each independent variable's comparable effect upon the dependent variable. The larger the standardized coefficient, the greater the relative effect upon the dependent variable. For example, if the standardized beta coefficient of an independent variable is 1.0, then a change of one standard deviation in the value of that independent variable will cause a change of one standard deviation in the dependent variable. To facilitate interpretation, we have rank ordered the list of variables in Table 3 by size of normalized regression coefficients.[3]

Given the large number of observations in the database, the regression is able to handle the large number of independent variables we have designated in Table 2 and sort out 21 as significant in determining the business growth rate index. Not surprisingly however, although statistically significant, the explained variance is only 23.2 percent. Since we are dealing with all business units in an entire economy, a large share of the variance in growth is likely to be attributable to other macroeconomic, sociological and individual behavioral characteristics that are not explicit in this regression.

Table 3
Regression Results Rank Ordered by Normalized Beta Coefficients

Variable	Coefficient Sign	Normalized coefficient	Statistical Significance

[3] Since the data are a census of all businesses, statistical significance is not a test of sample value as a population estimate. However, a census statistical relationship may occur due to measurement error that is always a problem with empirical data. Such error is stochastically distributed so the tests of significance listed here are a safeguard against including variables in our results that may appear due to chance alone because of measurement error. It should be noted that with over 11,000 cases, coefficients that are not significant at the .05 probability level represent very small effects.

1. AGE-4	**Negative**	**0,319**	0,000
2. BEGINDEP	Positive	0,180	0,000
3. BEGINDU7	Positive	0,101	0,000
4. BEGINDU6	Positive	0,090	0,000
5. BEGINDU13	Positive	0,073	0,000
6. BEGLEG	Positive	0,073	0,000
7. BEGSIZE	**Negative**	**0,071**	0,000
8. DAUIND	**Negative**	**0,067**	0,000
9. CORPSIZE	**Negative**	**0,065**	0,000
10. PARIND	**Negative**	**0,056**	0,000
11. BEGINDU8	Positive	0,053	0,000
12. INDDAU	Positive	0,050	0,000
13. PARDAU	**Negative**	**0,042**	0,000
14. BEGINDU10	Positive	0,039	0,000
15. BEGINDU12	Positive	0,036	0,000
16. BEGINDU2	**Negative**	**0,029**	0,004
17. BEGINTER	**Negative**	**0,028**	0,004
18. BEGINDU4	**Negative**	**0,027**	0,005
19. REGTYP6	**Negative**	**0,026**	0,015
20. BEGPAREN	Positive	0,024	0,029
21. CHLOCATI	Positive	0,020	0,015

R-squared = 0.2318 Mean dep. Var = 5.9436 Log likelihood = -43657.25
Adjusted R-squared = 0.2292 Prob(F-statistics):0.000 F-statistics = 98.932
S:E of regression = 1,196,450 S:D: dep var. = 13.590 Durbin-Watson stat = 1,897,961
Sum squared resid. = 1,597,832 Akaike info criterion = 4.967 Schwarz criterion = 4.984

Age and Independence

As others have found, age of business is significant and negative, i.e., older businesses grow more slowly. And, as indicated by the value of the standardized beta coefficient, age has the most influence on the growth rate index. Second in influence is beginning as an independent business firm, i.e., no parent corporate ownership. Interestingly, these two variables describe Schumpeterian entrepreneurship, i.e., young or new, independently owned firms.

Furthermore, variable number 20 in the rank order is "beginning as a parent." It impacts positively, although weakly, upon the business growth rate. "Beginning as a parent" means that the firm is independent and has one or more subsidiaries that are not included in the business size (BEGSIZE) measure but only in the corpo-

rate size measure (CORPSIZE). Thus, both types of independents have higher growth than the omitted alternative, i.e., beginning as a daughter company.

Three Industrial Sectors

The next three variables in the ranking are specific industry sector dummy variables. The positive sign on these dummies indicates that these industry sectors show greater impact on growth than the omitted sector, "metal working and manufacturing." We chose metal working and manufacturing for omission because it is very large in Sweden, a stable but cyclical industry, and it has a relatively modest growth rate. The three dummy variables represent "Other knowledge intensive services" (including computer services), "technical consultants," and "education and health care." These industrial sectors are widely acknowledged as above average growth industries. The high rank order of these industry variables and the appearance of eight of the industry variables in the regression equation suggest that industry effects upon growth rates are very important. This conclusion can be made with great certainty here because of our use of "business" as the defining entity thereby eliminating the blurring of industry influence on growth. The lower levels of industry impact reported by others may be due to their use of either establishment or enterprise definitions that cause combined industries to blur industrial sector influence.

Legal Form

The sixth variable in the ranking is beginning legal form. The positive coefficient here means that the limited liability form encourages the growth of firms. This confirms what others have found in other nations.

Business Size

Variable number seven is beginning size and it has a negative coefficient. This means that smaller businesses have greater growth ratios thereby agreeing with other researchers' findings. The position of this variable in the ranking may be lower than expected by proponents of entrepreneurship because the growth index we use tends to reduce the size of the variable's influence on growth by using average size, rather than beginning size, in the denominator. As noted by Kirchhoff and Greene [1998] use of this index is a comparative static approach to measuring the very dynamic phenomenon of entrepreneurship and therefore negatively distorts the full effect of new firm formation and growth. Thus, our use of a dependent variable selected for its statistical quality has yielded a less dynamic measure of growth that in turn depresses the influence of business size. Nonetheless, business size remains an important factor in determining growth.

Business size is closely followed by the owner organization overall size variable (CORPSIZE). The relationship is negative indicating the smaller owner organizations are related to greater growth in their owned

businesses. This agrees with other research findings where enterprise (or firm size) has been the unit of analysis. Small enterprises have greater growth rates. It also suggests that the greater resources that might be available from a large corporate owner are not adequate to overcome some other aspects of corporate ownership that depress growth rate.

It is important to note that the database contains firms with 20 or more employees in 1996. This may cause an exaggeration of the negative effect of business size. However, this should not have any effect on the impact of overall enterprise size. Our choice of growth rate index as the dependent variable also disfavors small businesses relative to a rate based upon beginning size alone. Since many other studies have found a negative size and growth relationship, we should be safe in interpreting the sign of our estimated effect as real although its magnitude may incorrectly understate the real effect of size upon growth rate.

Change in Governance

The eighth variable in rank order is change from daughter to independent. This means that the business was "spun-off" from the parent into an independent business. Since the missing dummy variable in this series is "no change in governance," the negative coefficient indicates that the effect of this action is a reduction in the growth rate compared to what would occur if no change happened. Undoubtedly, the two events -- spin-off and decline in employment -- are linked but neither is clearly the cause of the other. The reason for this negative relationship probably resides in an exogenous factor – spin-offs only occur when the parent corporation can no longer tolerate the poor profit performance of the daughter. The spin-off firm then proceeds to cut costs and reduce employment in order to turn around its profit position. Thus, unless there is an unanticipated surge in sales, the spin-off's survival depends on keeping the reduced costs and reduced employment for some time until survival is assured and growth returns through improved competitiveness.

Additional governance change variables also appear in the equation at similar normalized beta coefficient values. The tenth variable is change in governance from a parent to an independent. This means the parent has spun-off or closed its daughter businesses and experienced declining growth in employment. This is also consistent with the above discussion of the turn-around effort's impact on business firms but yields no clear information about cause and effect.

Number 12 is change from independent to daughter. This means a larger firm acquired the independent business with a positive impact upon growth. This suggests that the greater resources of the large firm are used to facilitate greater growth in the business. Such resources may be more than capital and could be specialized personnel, established distribution systems, greater marketing knowledge and skills, etc. Number 13 is change

from parent to daughter with a negative impact on growth. This represents an acquisition of a parent business by another firm. This acquisition, in contrast with the acquisition of an independent business, has a negative impact upon growth. This may be due to the parent business becoming distressed and laying off employees before being taken over by another firm while in distress.

More Industry Sectors

Close to these governance variables in normalized beta coefficient value are beginning industries 8, 10, 12, 2, and 4. Variables 8, 10 and 12 have positive coefficients indicating that these industries have above average growth impact on businesses within them. These industries are "banking, insurance and finance," "retail and wholesale," and "transportation and communication." Variables 2 and 4 have negative coefficients showing that these industries have below referred industry impact on businesses within them. Industry 2 is "wood, paper and pulp" and industry 4 is "mining and steelworks." No surprises here but this does reinforce our findings that industry sectors have significant impacts on business growth rates.

Foreign Operations

Businesses with foreign subsidiaries had lower growth rates than those without such subsidiaries. Cause and effect is difficult to decipher here.[4] The worldwide recession could be an exogenous cause, i.e.; the decline in overall economic activity may have hurt businesses with foreign subsidiaries more than others. Or, the foreign subsidiaries may have been widely used to "export jobs" to lower labor cost areas thereby reducing Swedish employment. Or, the growth of the subsidiaries may have shifted delivery of goods and services from export of value added by Swedish employees to foreign domestic production. This may have been necessary to preserve market position in the foreign nations in the face of increasing restrictions on imports. Whatever the cause, the effect of foreign subsidiaries was to reduce the growth rates of businesses that have them.

Location

Only one region type, Region 6 (variable 19) is significant and negative in its direction. Region type 1, "Stockholm," is the omitted dummy variable because it is the fastest growing area in Sweden. Since Region type 6 is negative, this means that its impact upon business growth rates is negative compared to Stockholm. Region type 6 is a grouping of many smaller communities in Sweden that share the characteristics of a mixed economic structure that is average for Sweden as a whole. These communities have no characteristics that make them different that "average." They have no special industries, business activities or population growth that

make them special. Apparently, the effect of the declining economic conditions during the recession depressed the growth of businesses therein. Given that the effects of industry specific factors have already entered the equation, the growth effects of this region is broader than any single industry sector can explain.

Change in location (variable 21), however, has a positive effect on business growth rate. Cause and effect is not apparent here. It is possible that fast growing businesses move more often than slower growing businesses. For example, faster growing manufacturing and service businesses will outgrow the physical facility and must necessarily move to larger quarters. Or alternatively, moving a business may increase its growth rate. This is definitely possible for retail businesses and other location sensitive businesses such as banking.

The location variables have a weak effect upon the independent variable as evident by their small normalized beta coefficient, among the weakest in rank order. Thus, region effects are minor compared to other factors.

Missing Variables

Many of the variables we included in our regression analysis do not appear as significant in our equation. Their absence provides insight into their influence on growth rates. First, change in industry sector is absence from the equation indicating that such changes have little influence on growth. This is also true for change in legal form. Apparently, growth oriented firms are or enter into the limited liability legal form and no additional change is necessary to achieve growth. Foreign ownership is also not significant and not in the equation. Thus, foreign ownership is neutral in its effect on growth suggesting that foreign ownership does not bias business growth performance in any specific direction.

Perhaps most significant is the absence of most of the geographical region variables and the very small effect of the two that do appear. This suggests business growth rates are not significantly affected by the location of the business. This is contrary to all the views of economic development directors who prefer to believe that their city or region is the best location for businesses. However, caution is advised in interpreting this weakness. Much of the regional differences that can be observed in Sweden are associated with industrial clustering. Thus, the entry of the variables representing industrial sectors may remove the variance otherwise associated with location. For example, it is likely that locating an automobile plant in far northern Sweden would be foolhardy given the clustering of this industry in south eastern Sweden and the long distances that parts and materials would have to be shipped if located in northern Sweden. Since all of these are dummy variables, co-

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[4] Keep in mind that the data reflect Swedish domestic employment, and do not include employment out-

linearity among them cannot be examined directly and there is no way to test for interaction among industrial sectors and location dummy variables.

Summary and Conclusions

We began this research as a quest for understanding what factors contributed to business growth rates in Sweden with special interest in business size, age, and industrial sector. We identified numerous categories of variables from previous research. We then used our own knowledge of business activity along with the wide assortment of measures available in the Swedish database to create a model of the factors that may affect business growth rates. The results of the regression analysis show us no surprises compared to research by others. Business age (the younger grow more), business independence, business size (smaller grow more), and limited liability legal form are all confirmations of previous research. Importantly, we demonstrate that Swedish businesses are largely influenced by the same factors as reported for other nations, the U.S., Germany and Scotland. There seems to be a universality of these factors in all western capitalist nations.

The addition we make to the literature is the appearance of the strong influence of industry sectors upon business growth rates and the clear indications of which sectors contribute to above or below average growth. This we were able to do by uniquely defining our date in terms of "business" rather than adopting the traditional enterprise and establishment definitions. These results suggest that earlier research has understated the importance of industry in determining business growth rates. Simply stated, it is much more important for a business to be in a growth industry than earlier research has indicated.

Another unique contribution is identification of the impact of mergers, acquisitions and spin-offs upon business growth rates. By identifying and including measures of changes in governance, we have shown that such changes do affect growth rates. Acquisitions seem to be accompanied by greater growth of the acquired firm if it was previously independent. However, acquisition (or merger) of a parent business (one with subsidiaries) is accompanied by a decline in growth of the acquired business. Spin-offs are clearly accompanied by a decline in growth of the spun-off business. Thus, the direct effect of mergers and acquisitions are somewhat mixed depending on the governance of the business before the change. Arguments about the long-term effects of these changes in governance will continue, but this research has added a dimension of that says the type of acquired or merged business is important in determining the impact upon growth.

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side of Sweden.

Conclusions for the Aspiring Entrepreneur

From the aspiring, growth oriented entrepreneur's perspective, these results are quite positive because they suggest that the factors that underlie growth largely favor the entrepreneur during business founding. The age, size and independence effects suggests that small, owner-managed firms in their early years have better than average growth opportunities. One caution, however, is that the entrepreneur should choose a growth industry and begin the business as a limited liability legal form. All these choices are in the command of the entrepreneur.

The almost complete lack of location effects suggests that building a growth business is possible in almost any geographical area. So the entrepreneur is free to locate wherever s/he lives. Some caution is advisable regarding this conclusion, as the suitability of the location is likely to interact with choice of industry since industry clustering is a widely observed phenomenon with obvious advantages. But, then it may be that ambitious entrepreneurs have always known this intuitively as indicated by the variety of anecdotes on successful growth business start-ups.

These results may be limited to Sweden given the source of the data. However, since many of the findings a very similar to results found in the U.S. and Germany, it is possible that all of the results are generally applicable.

Recommendations for Public Policy

From the public policy makers' perspective, the results are very much a quandary. So much of the business growth is determined by strategies taken by the individual entrepreneur that there is little room for public policy to exert any influence. This also confirms a widely held belief among public policy advocates that there are few effective public policies for promoting growth of new, independently owned small businesses. However, while cautioning policy-makers against business, or micro, level involvement, our results actually leave more room for industry level promotional policies than suggested by other studies that have concluded that growth firms are almost evenly distributed across industries. Our results strengthen the suspicion that such conclusions may be due to methodological limitations (cf. Delmar et al, 1999) and suggest that the nurturing of growth industries would simultaneously encourage an increased number of new, independent high growth firms.

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